



Project Summary

Evaluation of Barriers to the Use of Radiation-Cured and Hot Melt Coatings in Coated and Laminated Substrate Manufacturing

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In support of EPA's Source Reduction Review Project (SRRP), maximum achievable control technology (MACT) standards development, and the Pollution Prevention Act, EPA's National Risk Management Laboratory (NRMRL) is investigating the current industrial use of and barriers to the extended use of radiation-cured coatings in SRRP and MACT categories. The report gives results of a study to investigate and identify the technical, educational, and economic barriers to the use and implementation of radiation-cured and hot melt coatings in coated and laminated substrate manufacturing. Important barriers include: capital cost, adhesive cost, lack of data on physical properties of adhesives, and aesthetics of the end product. The report identifies work areas that could help overcome technical, educational, and economic barriers identified. Discussed opportunities include: (1) convening a focus group to discuss identified barriers, identify other barriers, and begin the process to overcome these barriers; (2) investigating the use of radiation-curable systems in Europe; (3) researching the marketing difficulties associated with non-solvent-based products; (4) investigating state economic incentive programs to determine if financial assistance can be given to manufacturing facilities to help encourage the testing of radiation-curable adhesives; and (5) developing a software system that will provide physical property data and other important information on alternative adhesive formulations to assist facilities in identifying alternative to their current solvent-based adhesives.

This Project Summary was developed by EPA's National Risk Management Research Laboratory's Air Pollution Prevention and Control Division, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Background

Section 4(b) of the Pollution Prevention Act of 1990 requires the U.S. Environmental Protection Agency (EPA) to "review regulations of the Agency prior and subsequent to their proposal to determine their effect on source reduction." In support of the Pollution Prevention Act, EPA established the Source Reduction Review Project (SRRP) to focus its review on regulations (and anticipated regulated industries) that will soon be mandated under the Clean Air Act Amendments of 1990 (CAAA), the Clean Water Act (CWA), or the Resource Conservation and Recovery Act (RCRA). A goal of SRRP tasks is to ensure that source reduction and multimedia issues are considered during the development of upcoming air, water, and hazardous waste standards.

Maximum achievable control technology (MACT) standards to reduce hazardous air pollutants (HAPs) from major source categories are regulations under the CAA and a focus of SRRP. Promulgation of these regulations began in 1992 and will continue into the decade and into the next century. The MACT standards offer EPA an excellent opportunity to use SRRP to incorporate pollution prevention (P2) measures into the upcoming standards for spe-

cific source categories. P2 efforts offer economic and reduced health and ecological risk benefits to many sectors of society that are not available through traditional pollution control methods.

In support of the SRRP Program, MACT standards development, and the Pollution Prevention Act, EPA's National Risk Management Laboratory (NRMRL) is investigating P2 opportunities for product and material substitutions that help industry to reduce waste. The objective of this project was to investigate the current industrial use and barriers to the extended use of radiation-curable coatings. Adhesive-Coated and Laminated Substrates (SICs 2671 and 2672--typical products include masking and duct tape, adhesive labels, and adhesive coated foam products--an industry facing upcoming MACT standards, was selected as an industrial segment for this study. Thus, when the MACT standards are developed, EPA will have a better understanding of coating technologies that are feasible P2 alternatives for this industry.

Introduction

The report gives results of a study to investigate and identify the technical, educational, and economic barriers to the use and implementation of radiation-curable coatings within the coated and laminated substrate industry. The project involved preparing category analyses, identifying and classifying barriers to the use and implementation of the technology, evaluating and assessing the environmental impacts, and identifying P2 and source reduction research opportunities within the coated and laminated substrate industry. Information was collected for the project from a review of current technical literature through cooperation with industry leaders and the leading trade organizations; and through visits to coated and laminated substrate facilities, radiation-curable coating and equipment suppliers, and an international trade show.

Radiation-curable processes for the coated and laminated substrate industry involve either electron beam (EB) or ultraviolet (UV) curing mechanisms to pen-

etrate and cure the radiation-curable coating to the substrate. These two methods of curing provide many technical, economic, and environmental benefits to traditional solvent-based systems including increased bonding strength, resistance to chemical and thermal elements, increased throughput, reduced cost per unit area, and substantially lower environmental emissions. In addition, both EB and UV curing systems can use most available substrates, present coating application systems, and less floor space.

The report divides the barriers to implementing EB and UV curable systems into three categories: technical, economic, and educational. Separate chapters examine each of the three barrier categories.

Technical barriers include: the lack of industry knowledge of these systems since no production line for coated and laminated substrate manufacturers is operating in the U.S.; equipment suitability; materials availability (coatings are manufactured and sold by few companies); product and adhesive performance characteristics (appearance, odor, and tack differences with solvent-based products); and health and safety issues (radiation as a means of curing).

Economic barriers provide a challenge to implementing either an EB or UV curing system. Economic concerns involve the capital investment of the system, pricing pressure from customers and competitors, the payback period of the machinery, and operating costs of the radiation-curing (specifically, EB curing) mechanism.

The primary education barriers to implementing either an EB or UV curing system are divided into the viewpoints of management and other employees. Management expressed concern about the cost, performance, and productivity of the radiation curing technology, and other employees expressed concerns regarding handling radiation curable coatings and radiation safety.

Hot melt adhesives, another alternative to solvent-based systems, are also discussed in this report. Hot melt adhesives are solids that are heated to their melting

points and applied to the substrate in their liquid state. Hot melt adhesives are currently used in many applications and provide an alternative to the solvent-based systems. Certain hot melt adhesives can be reformulated and used as the EB system's adhesive. Technical, economic, and educational factors of hot melt adhesives are also examined.

The report identifies work areas that could help overcome the technical, educational, and economic barriers identified. Among the opportunities discussed are:

- Convening a focus group of representatives from industry, trade associations, environmental agencies, radiation-curable coating and equipment suppliers, and other interested parties to discuss identified barriers, identify others, and begin the process to overcome these barriers.
- Investigating the use of radiation-curable systems in European markets to determine the problems or opportunities they have discovered as a result of actual production using these alternative adhesives.
- Researching the marketing difficulties associated with non-solvent-based products. A study of specific characteristics of a product which improve its marketability (e.g., aesthetics) would be beneficial.
- Reviewing state economic incentive programs (EIPs) which assist facilities in developing low-volatile organic compound (VOC) surface coatings. This information could be transmitted to coated and laminated substrate manufacturers to assist them in meeting requirements to receive the financial benefits.
- Developing a publicly available computer-based information system which would contain the performance characteristics of various adhesive formulations to assist coated and laminated substrate manufacturers in finding alternatives to solvent-based adhesives.

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The complete report, entitled "Evaluation of Barriers to the Use of Radiation-Cured and Hot Melt Coatings in Coated and Laminated Substrate Manufacturing," (Order No. PB96-153 564; Cost: \$28.00, subject to change) will be available only from:

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